Math 1

Fall Semester Study Guide

Some things that you will want to remember for the exam:

- When graphing the solution to an inequality in one variable that uses $<$, $\leq$, $>$, or $\geq$, if the variable is isolated and on the left hand side, then the inequality points in the direction that you should shade.
- When graphing using *any* set of axes (number line or Cartesian coordinate system), provide an appropriate scale.
- When graphing on the Cartesian coordinate system, label axes.
- When graphing more than one line/curve on the Cartesian coordinate system, provide a way to distinguish among the graphs. Methods of distinguishing include labelling each line/curve with its equation and color coding the lines/curves.
- When graphing an inequality or system of inequalities, shade the appropriate region. Lack of shading is an automatic R in standard 2A.
- When graphing an inequality or system of inequalities, use a dashed line when the line is not part of the solution set.
- The format for interval notation is "lower number comma high number". Use a bracket to indicate that an endpoint is part of the solution set. Use a parenthesis to indicate that endpoint is not part of the solution set. Since $-\infty$ and ∞ are not numbers, they are *never* part of the solution set.
- When writing a system of equations or inequalities, use a left brace to indicate that the statements are grouped together.
- When solving a system of equations using matrices, the valid row operations include swapping rows, multiplying (or dividing) every entry in a row by a nonzero number, and replacing a row of the matrix with the sum of the row to be replaced and one other row. (We often combine the last two row operations to save time.) The goal is to perform valid row operations on the matrix until the part to the left of the vertical bar is an identity matrix.

Sequences

Arithmetic sequences have a common difference d. Thus, the portion of the recursive formula that tells how to get from one term to the next is of the form

$$f(n+1) = f(n) + d.$$

Also, if any arithmetic sequence is graphed, the points will be collinear, and the slope of the line will be d. Assuming that the arithmetic sequence starts at $n = 1$, its explicit formula is of the form

$$f(n) = d(n-1) + f(1).$$

You will need to adjust if the starting value is different.

Geometric sequences have a common ratio r. Thus, the portion of the recursive formula that tells how to get from one term to the next is of the form

$$f(n+1) = f(n) \cdot r.$$

Also, if any geometric sequence is graphed, the points will lie on one exponential curve (if $r > 0$ and $r \neq 1$) or two exponential curves (if $r < 0$ and $r \neq -1$). Assuming that the geometric sequence starts at $n = 1$, its explicit formula is of the form

$$f(n) = f(1) \cdot r^{n-1}.$$

You will need to adjust if the starting value is different.

Note that, for geometric sequences, we rarely deal with the cases $r = -1$, $r = 0$, and $r = 1$.

Sequences that are neither arithmetic nor geometric may have recursive and explicit forms; however, even if they do exist, they may be difficult to determine. Not all sequences (even those whose outputs are all numbers) have definite patterns.

Average Rate of Change

The average rate of change on an interval is equal to the slope of the line segment whose endpoints are the two points on the function with x coordinates at the endpoints of the interval. For example, the average rate of change of $y = x^2$ on $[-5, 2]$ is

$$m = \frac{2^2 - (-5)^2}{2 - (-5)} = \frac{4 - 25}{7} = \frac{-21}{7} = -3.$$

Interest Formulas

Let P be the principal, A be the final balance (with P and A in the same units), r be the annual interest rate as a *decimal*, and t be the time in years.

The formula for the final balance for simple interest is

$$A = P(1 + rt).$$

The formula for the final balance for compound interest compounded once per year is

$$A = P(1 + r)^t.$$